

CLAIMS:

1. Apparatus for sensing information regarding a surface, comprising:

a first plurality of optical elements arranged to acquire two dimensional information about a surface;

a second plurality of optical elements arranged to acquire topographical information about said surface;

said first plurality and said second plurality of optical elements being arranged to simultaneously provide said two dimensional information and said topographical information to at least partially non-overlapping portions of a single sensor array.

2. The apparatus claimed in claim 1, wherein said first plurality of optical elements is arranged to acquire said two dimensional information from a first portion of said surface while said second plurality of optical elements acquires said topographical information from a second portion of said surface.

3. The apparatus claimed in claim 2, wherein said first portion of said surface and said second portion of said surface are at least partially non-overlapping.

4. The apparatus claimed in claim 3, wherein said first portion of said surface comprises a first elongated region of said surface, and said second portion of said surface comprises a second elongated region of said surface.

5. The apparatus claimed in claim 1, further comprising:  
a displacer operative to provide mutual displacement between said surface and said first plurality of optical elements during acquisition of said two dimensional information.

6. The apparatus claimed in claim 5, wherein a first portion of said surface whereat two-dimensional information is acquired comprises a first elongated region of said surface, and a second portion of said surface whereat topographical information is acquired comprises a second elongated region of said surface at least partially non-overlapping with said first elongated region.

7. The apparatus claimed in claim 5, said displacer being further operative to provide mutual displacement between said surface and said second plurality of optical elements during acquisition of said topographical information.

8. The apparatus claimed in claim 1, wherein said first plurality of optical elements comprises an imaging lens shared with said second plurality of optical elements, said imaging lens receiving acquired two dimensional information and acquired topographical information.

9. The apparatus claimed in claim 8, wherein said imaging lens is operative to generate an image of a first portion of said surface on said sensor for acquiring two dimensional information corresponding to said first portion, and to generate an image of a line of illumination at a second portion of said surface for acquiring a topographical information corresponding to said second portion.

10. The apparatus claimed in claim 2, further comprising:  
a first plurality of illumination optical elements arranged to illuminate said first portion of said surface with illumination suitable for acquiring two dimensional information about said surface; and  
a second plurality of illumination optical elements arranged to illuminate said second portion of said surface with

illumination suitable for acquiring topographical information about said surface.

11. The apparatus claimed in claim 10, wherein said first plurality of illumination optical elements comprises at least one light emitter arranged to provide illumination at least some illumination from within a first range of converging angles relative to a first axis, and additional illumination from within a second range of converging angles relative to said first axis.

12. The apparatus claimed in claim 11, wherein said at least one light emitter comprises a plurality of laser diodes.

13. The apparatus claimed in claim 12, wherein said illumination optical elements comprise a diffuser diffusing light from said at least one light emitter along a second axis generally perpendicular to said first axis.

14. The apparatus claimed in claim 13, wherein said diffuser comprises a lenticular array.

15. The apparatus claimed in claim 10, wherein said second plurality of illumination optical elements comprises at least one light emitter arranged to illuminate a linear region on said surface from a direction generally perpendicular to said surface.

16. The apparatus claimed in claim 15, wherein said at least one light emitter comprises at least one laser emitter emitting structured light.

17. The apparatus claimed in claim 1, wherein said first plurality of optical elements is arranged to view a first

portion of said surface from a direction generally perpendicular to said surface.

18. The apparatus claimed in claim 17, wherein said second plurality of optical elements is arranged view a second portion of said surface from a direction angled with respect to said surface.

19. The apparatus claimed in claim 1, wherein said second plurality of optical elements is arranged view a second portion of said surface from a direction angled with respect to said surface.

20. The apparatus claimed in claim 18, wherein said first portion is illuminated by illumination provided at a plurality of angles relative to said surface.

21. The apparatus claimed in claim 18, wherein said second portion is illuminated by illumination that is provided from a direction generally normal to said surface.

22. The apparatus claimed in claim 2, wherein an optical path distance between said first portion and said single sensor array is equal to an optical path distance between said second portion and said single sensor array.

23. Apparatus for sensing information regarding a surface, comprising:

a first plurality of optical elements arranged to acquire two dimensional information about a surface; and

a second plurality of optical elements arranged to acquire topographical information about said surface during acquisition of said two dimensional information, said second plurality of optical elements comprising an illuminator

illuminating a first portion of said surface from a direction being generally perpendicular to said surface.

24. The apparatus claimed in claim 23, wherein said first plurality of optical elements are arranged to acquire said two dimensional information from a direction being generally perpendicular to said surface.

25. The apparatus claimed in claim 24, wherein said second plurality of optical elements are arranged to acquire said topographical information from a direction being generally non-perpendicular to said surface.

26. The apparatus claimed in claim 23, wherein said second plurality of optical elements are arranged to acquire said topographical information from a direction being generally non-perpendicular to said surface.

27. The apparatus claimed in claim 23, further comprising a beam combiner, wherein:

said first plurality of optical elements and said beam combiner define a first optical path for viewing a first portion of said surface from a direction generally perpendicular thereto; and

said second plurality of optical elements and said beam combiner define a second optical path for viewing a second portion of said surface from a generally non-perpendicular angle.

28. The apparatus claimed in claim 27, further comprising:  
at least one sensor sensing information about said surface; and

a displacer operative to displace said surface and said sensor relative to each other while said sensor is sensing said information.

29. The apparatus claimed in claim 28, wherein said first portion and said second portion are generally non overlapping.

30. The apparatus claimed in claim 28, wherein said at least one sensor comprises a single sensor array operative to sense two-dimensional information corresponding to said first portion at a first location in said sensor array and to sense topographical information corresponding to said second portion at a second location in said sensor array.

31. The apparatus claimed in claim 30, wherein said first location is generally non-overlapping with said second location.

32. Apparatus for illuminating a surface for simultaneously sensing two dimensional and topographical information regarding the surface, comprising:

a first source of illumination illuminating a first portion of a surface with first illumination suitable for sensing two-dimensional information about said surface, said first portion being elongated along a first axis, said first illumination impinging upon said surface from within at least two different ranges of angles relative to a second axis that intersects said first axis; and

a second source of illumination illuminating a second portion of said surface with second illumination suitable for sensing topographical information about said surface, said second portion being elongated along said first axis, said second illumination impinging on said surface from a direction perpendicular to said surface relative to said second axis.

33. The apparatus claimed in claim 32, wherein said first portion and said second portion are non-overlapping.

34. The apparatus claimed in claim 32, wherein a width dimension of said first portion along said second axis is wider than a width dimension of said second portion along said second axis.

35. The apparatus claimed in claim 32, wherein a first range of angles within said at least two different ranges of angles is non overlapping with a second range of angles within said at least two different ranges of angles.

36. Apparatus for illuminating a surface with coherent light, comprising:

- an emitter emitting coherent light;

- a collimating lens collimating light emitted by said emitter;

- a first diffuser receiving said collimated light and spreading said collimated light at each of a multiplicity of locations along a first axis; and

- a cylindrical lens receiving light from said diffuser and concentrating said light onto a surface.

37. Apparatus for sensing information about a surface, comprising:

- at least one lamp emitting coherent light;

- a diffuser arranged to receive said coherent light and output light appearing as emitted from a multiplicity of locations on said diffuser, light at each location being output in a plurality of directions;

- a lens arranged to receive light from said diffuser and to concentrate said light onto a surface; and

- a sensor array comprising a multiplicity of sensor elements, said array being arranged such that a location on said surface is sequentially sensed by at least two sensor elements.

38. The apparatus claimed in claim 37, wherein said lamp comprises a laser.

39. The apparatus claimed in claim 38, wherein said laser comprises diode laser.

40. The apparatus claimed in claim 37, wherein said diffuser comprises a lenticular array diffusing said coherent light along a first axis, but not along a second axis orthogonal to the first axis.

41. The apparatus claimed in claim 40, wherein said lens comprises a cylindrical lens focusing light from said diffuser along said first axis.

42. The apparatus claimed in claim 41, wherein said cylindrical lens comprises a fresnel lens.

43. The apparatus claimed in claim 37, wherein said sensor array comprises a CMOS sensor array.

44. The apparatus claimed in claim 43, wherein said CMOS sensor array comprises a sensor array configured to operate in a memory integration mode of operation.